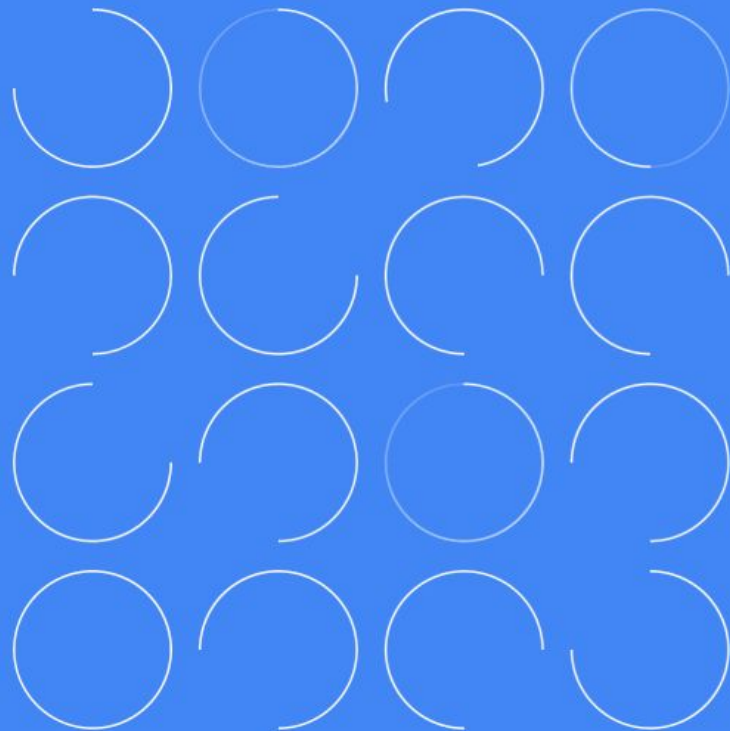


**We'll be starting at
18:40**

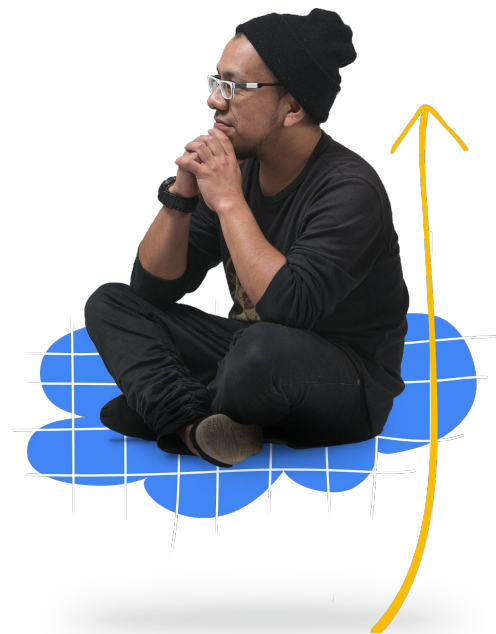
今天簡報 → linktr.ee/youjun_talk

提問可以透過 Google Meet 右下角
的聊天區  做發問



Introduction to AI/ML/DL & Google Cloud AutoML

GDSC 2022 Tamsui Campus Plan
Event Date: 2022/04/17 evening
Speaker: Youjun(余佑駿)



Google Developer Student Clubs



余佑駿 Youjun
Cloud Architect

Facebook littlefish0331

LinkedIn you-jun-yu

GitHub littlefish0331

Email littlefish0331@gmail.com

【 經歷】

2021 宏庭股份有限公司 Microfusion Technology
GCP解決方案部 雲端架構師

2019 國家高速網路與計算中心 資料科學家

2017 國立政治大學 統計所

2012 國立清華大學 數學系輔修教育學程



【 競賽/Side-Project/演講】

2022 (GDSC-TKU)
Introduction to Data Visualization & Data Studio

2021 (GDG)
How to Migrate Your Google Drive to Cloud Storage

2021 (Tbrain) Tomofun 狗音辨識: 4th + 評審獎

2019 (Kaggle) LANL Earthquake Prediction: top 23%

塵世中一個迷途小書僮，從資料科學走向雲端科技。

平時喜歡數據分析、機器學習、參與社群活動。

希望用科技創造更美好的世界。

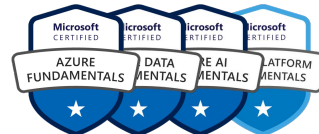
Linktree

linktr.ee/youjun



履歷、專案
社群分享

可以交流
考證照經驗



AI / ML / DL

Agenda

Google Cloud AutoML



Time

Topic

18:35 - 18:55	Module 1: 資料科學承先啟後 <ul style="list-style-type: none">• Definition• 歷史發展• What will happen in future?
18:55 - 19:25	Module 2: Google Cloud AutoML <ul style="list-style-type: none">• Overview• Compare to ML API• Use Case, Scenario and demo
19:25 - 19:35	QA & Take a Break

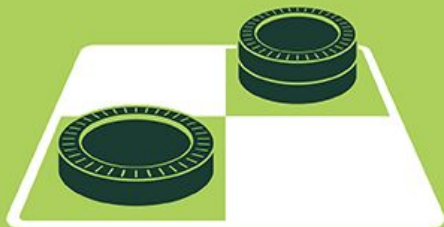
資料科學承先啟後

- AI/ML/DL Overview
- Challenge
- What will happen in future?

AI Overview

ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



MACHINE LEARNING

Machine learning begins to flourish.



DEEP LEARNING

Deep learning breakthroughs drive AI boom.



1950's

1960's

1970's

1980's

1990's

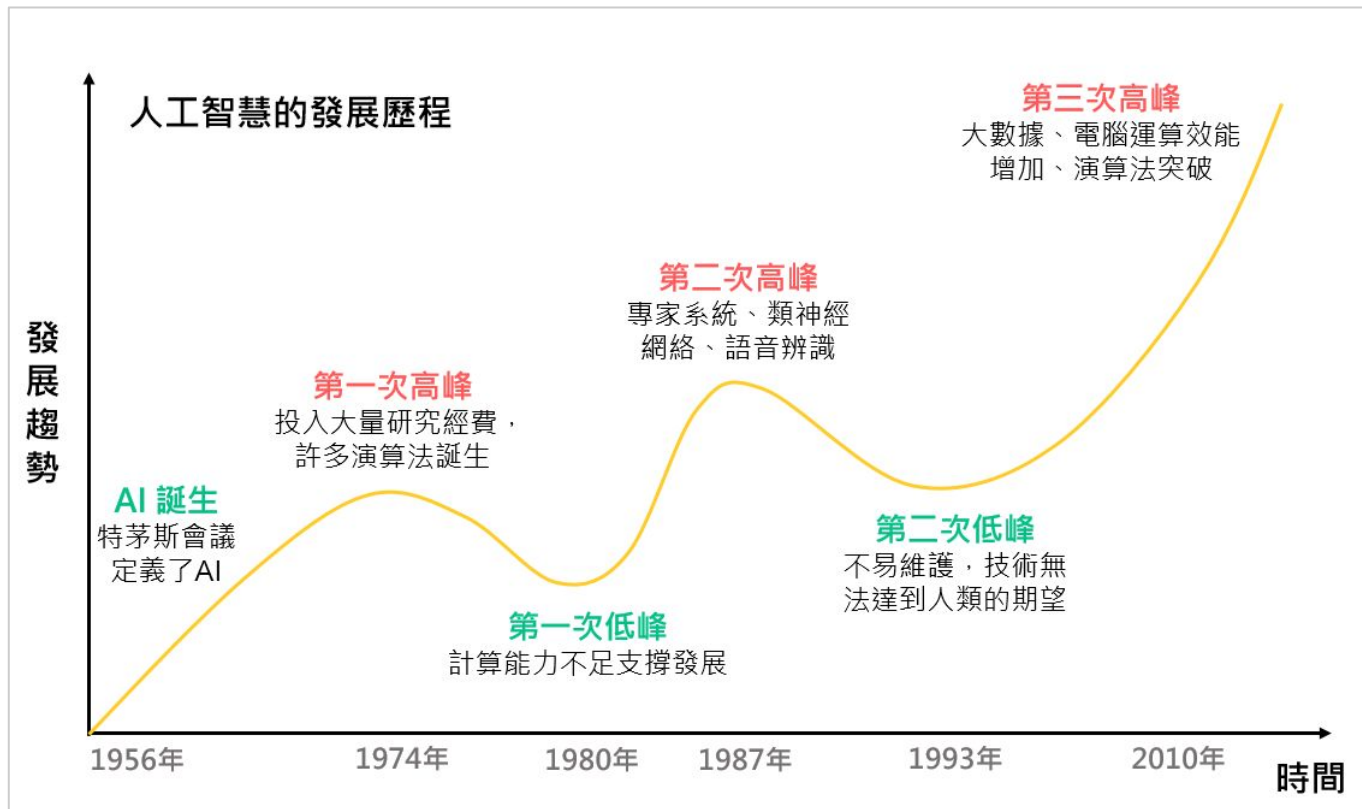
2000's

2010's

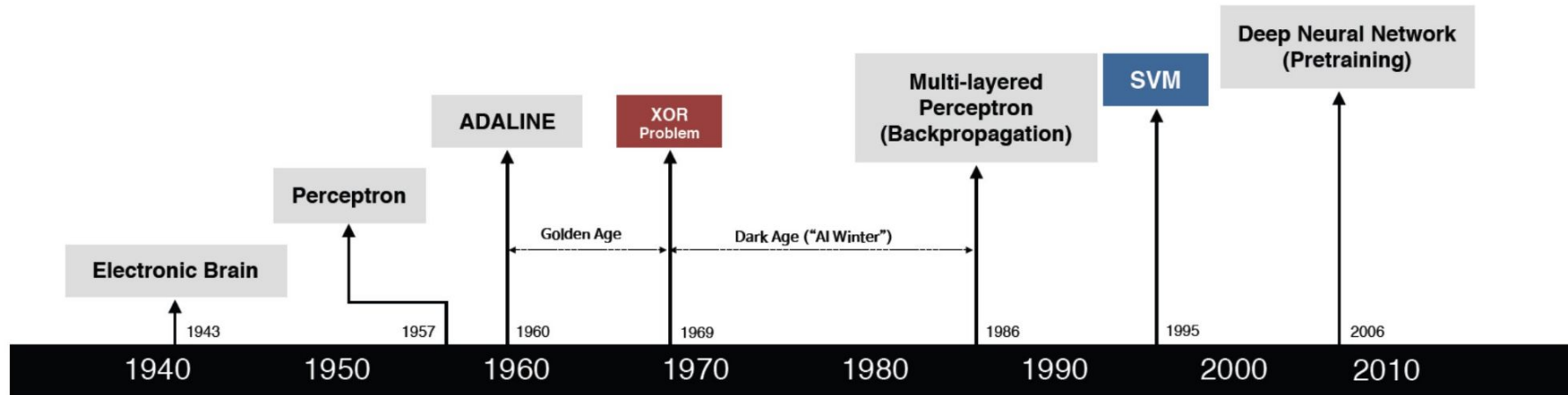
Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

AI Overview – 領域差異化

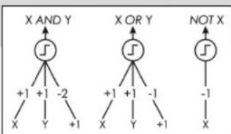
- **✗** 大一統
- **✓** 分而治之



AI Overview – DL 不是一天造成的



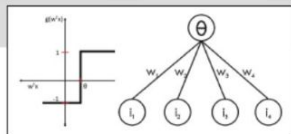
S. McCulloch – W. Pitts



- Adjustable Weights
- Weights are not Learned



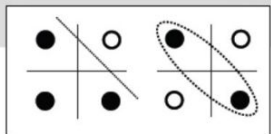
F. Rosenblatt B. Widrow – M. Hoff



- Learnable Weights and Threshold



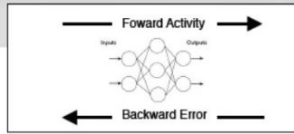
M. Minsky – S. Papert



- XOR Problem



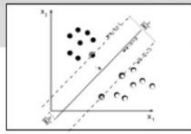
D. Rumelhart – G. Hinton – R. Williams



- Solution to nonlinearly separable problems
- Big computation, local optima and overfitting



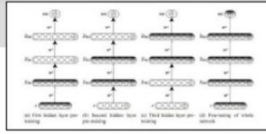
V. Vapnik – C. Cortes



- Limitations of learning prior knowledge
- Kernel function: Human Intervention



G. Hinton – S. Ruslan

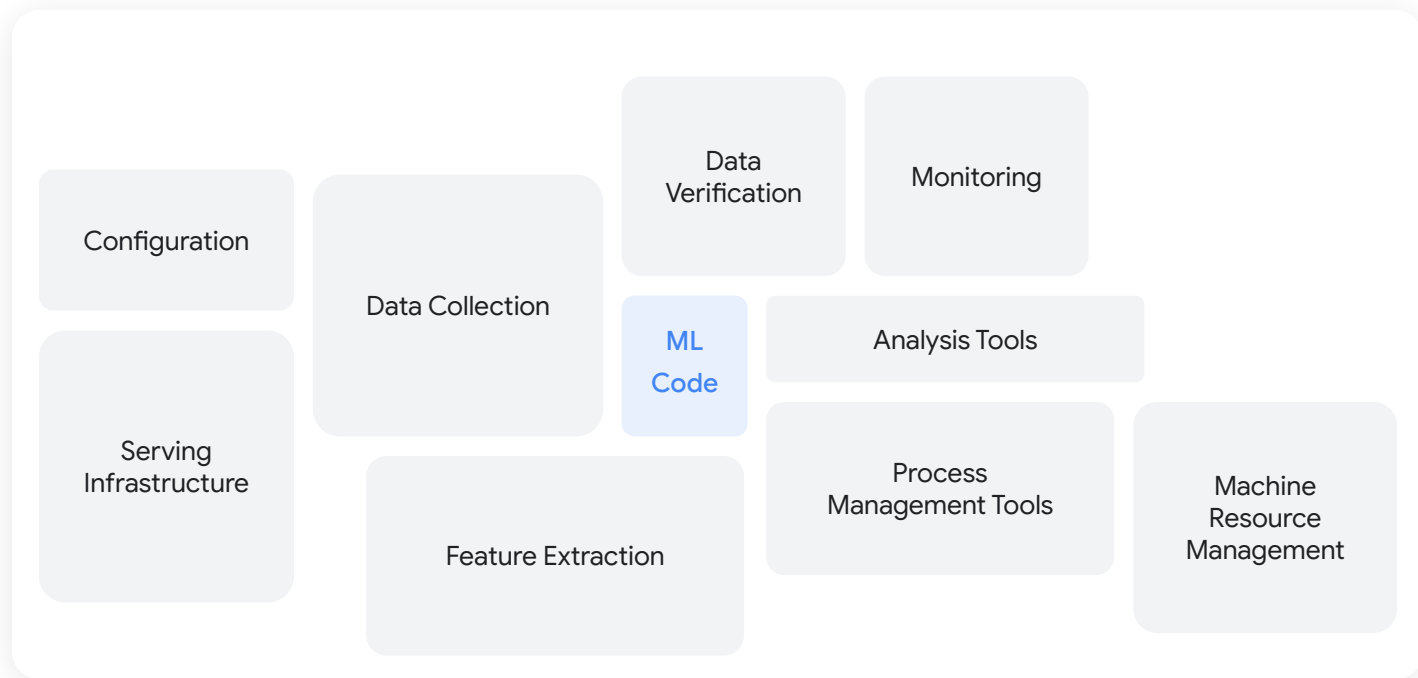


- Hierarchical feature Learning

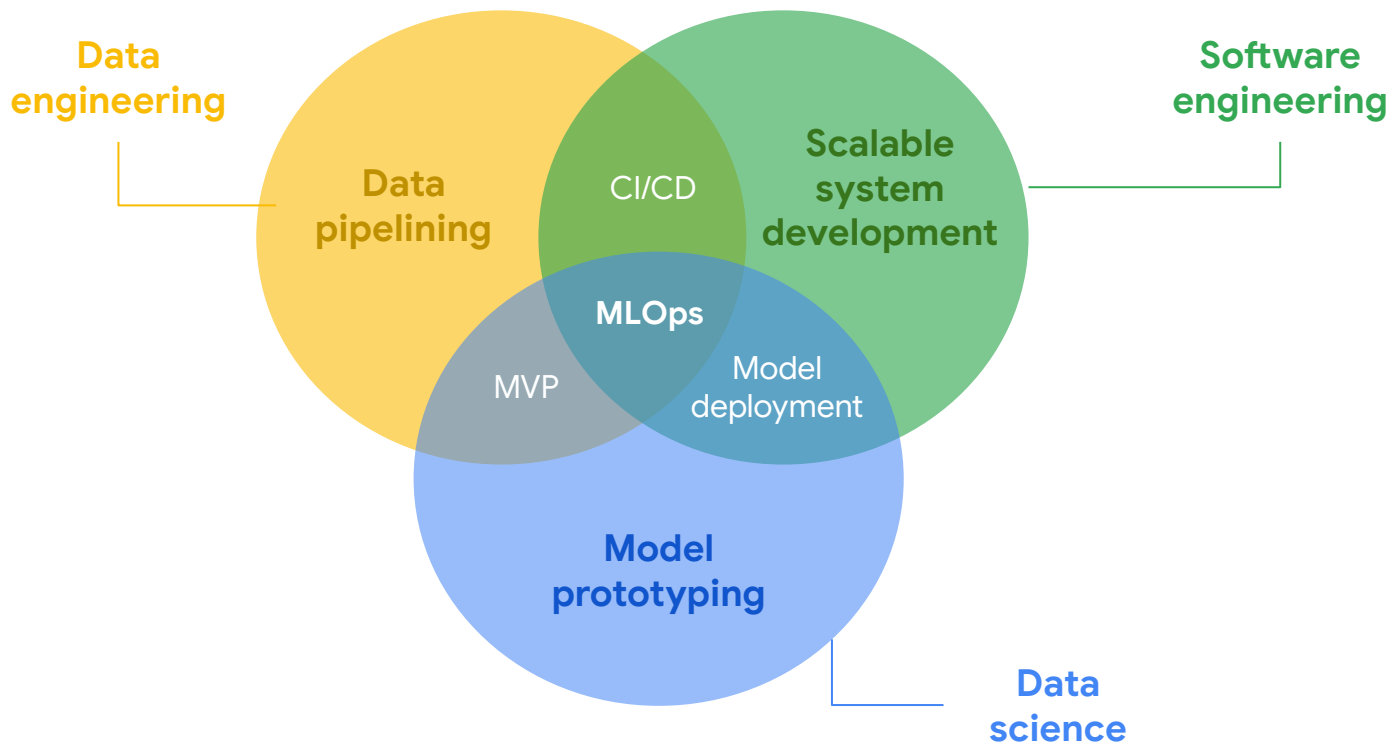
Challenges of Operational ML Systems

“ More than 87% of data science projects **never make it into production.** –Multiple studies and surveys*

Operational ML System



MLOps - Capability We Need



What will happen in future?



Web 1.0
"Read Only",
Decentralized



Web 2.0
Participatory,
Centralized



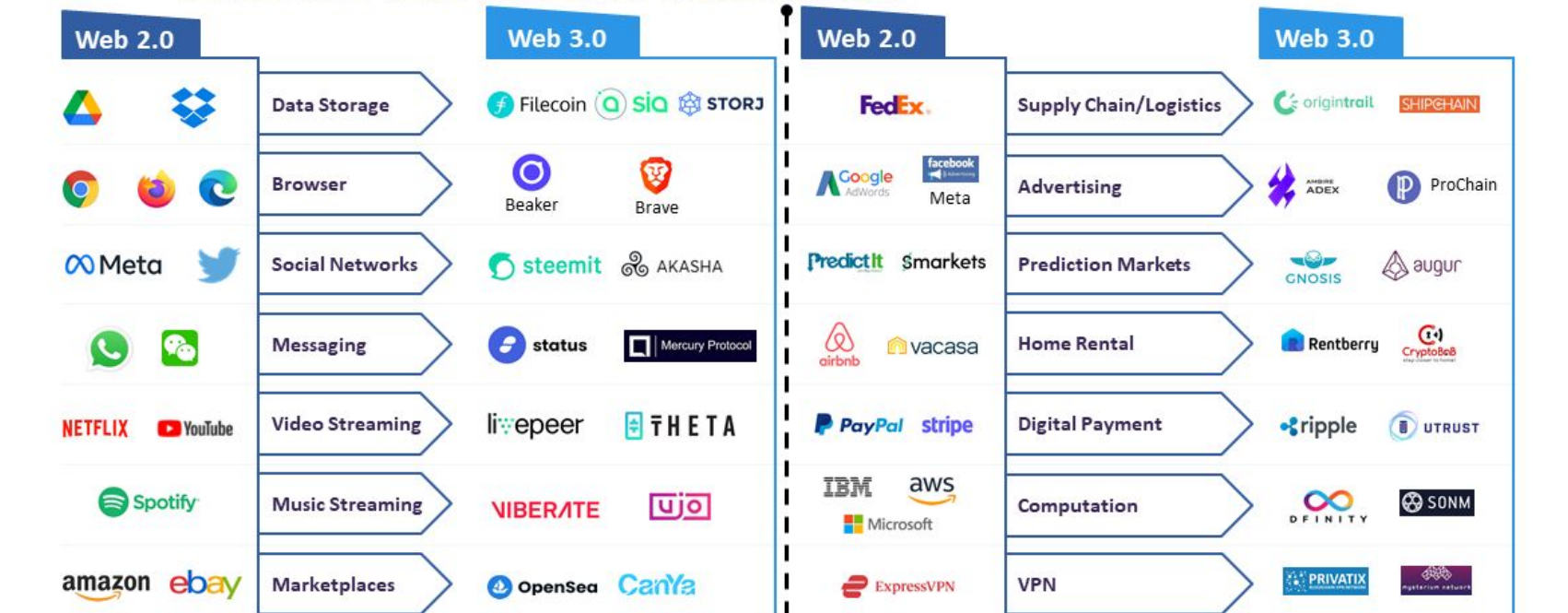
Web 3

No Intermediaries,
Decentralized

What will happen in future? (cont.)



Web 3.0 companies offer big tech alternatives for a smooth transition into the new internet era



Source: GlobalData FutureTech Series Report

Google Cloud AutoML

- Overview
- Take a glance at ML API
- Introduction to AutoML
- Use Case, Scenario and demo

Google Cloud AI/ML Strategy

 [AI & Machine Learning Products | Google Cloud](#)

Tools / Stage / for different business market and audience

Solution	senario or tools
ML API	for tech (e.g. develop)
AutoML Services	build GUI for ML API . (e.g. document AI, NLP, image, Vision, Table, etc.)
AI Platform	integrate all AutoML Service . (ready to deprecate)
Vertex AI	integrate AutoML , Kubeflow, and TensorFlow Extended (TFX)

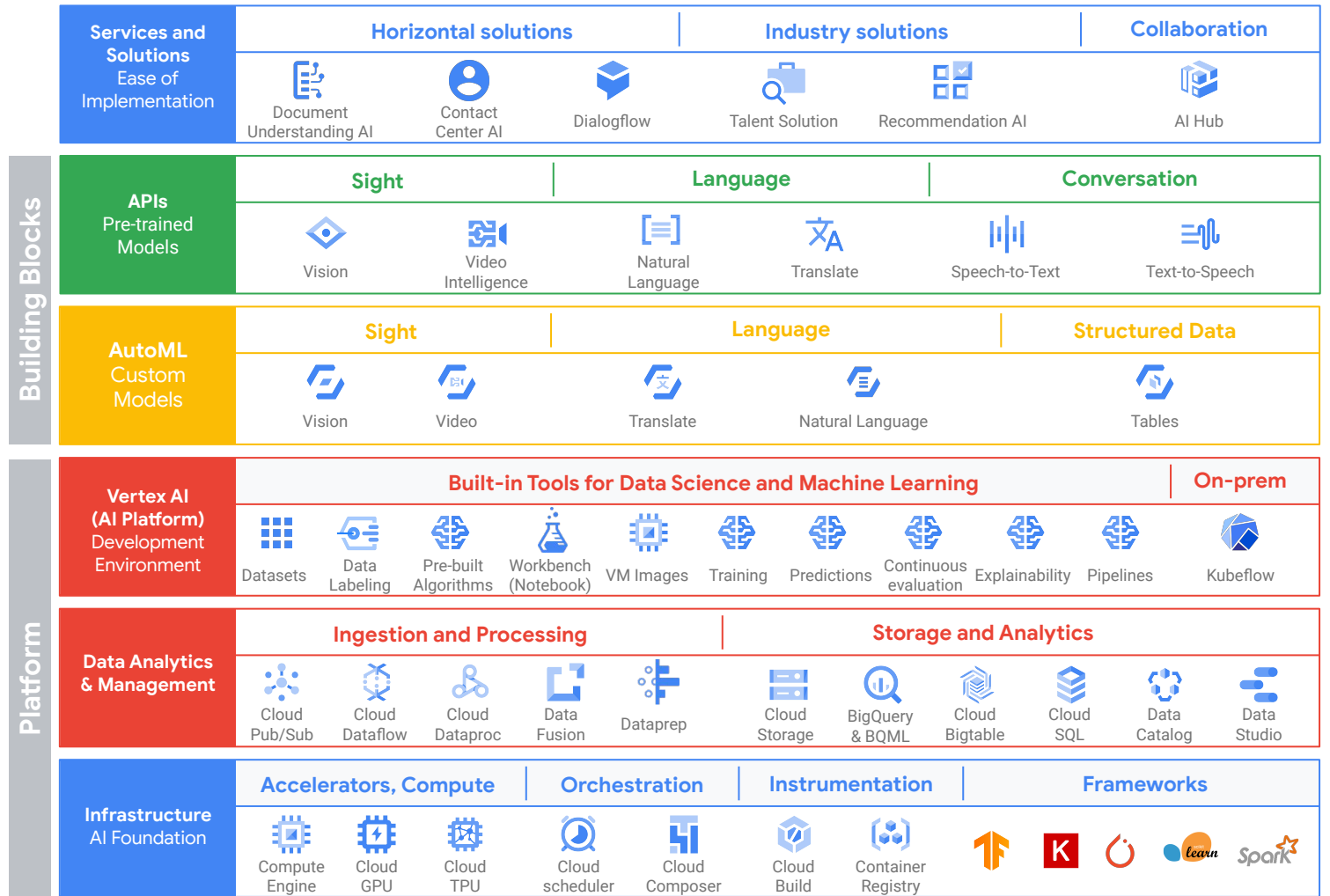
PaaS for tech & non-tech

Total Solutions

 [AI and Machine Learning Solutions | Google Cloud](#)

Solution	senario or tools
Contact Center AI (CCAI)	integrate Dialogflow, STT, TTS, NLP
Document AI	integrate Vision OCR, Human-in-the-Loop
Intelligent products (Preview)	integrate Intelligent Products, Pre-built app templates for optimizing MRO
Product Discovery	integrate Vision Product Search, Recommendations AI, Retail Search

AI for every level of expertise



AI for every level of expertise



ML developer
Intelligent apps



Data analyst
Query and analyze



Data scientist
Models that work



Data engineer
Get clean, useful data



ML engineer
Models in production

Services and Solutions
Ease of Implementation

Fastest way to start using AI today

APIs
Pre-trained Models

No training data needed, get started right away

AutoML
Custom Models

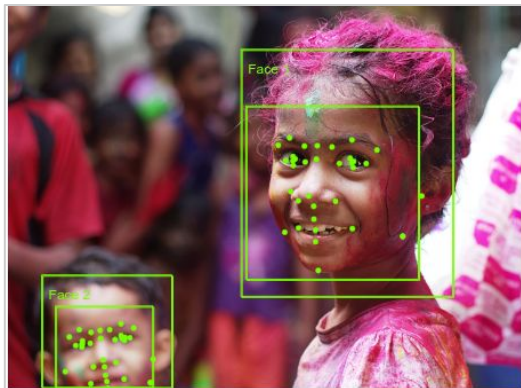
Easily create custom models (A no-code approach)

AI Platform
Development Environment

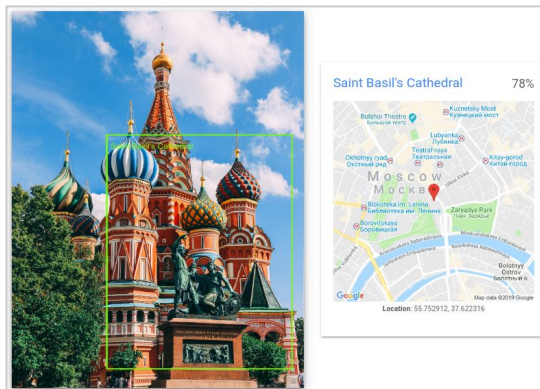
Data Analytics & Management

Lots of control possible, but need Data Science / ML expertise

Infrastructure
AI Foundation



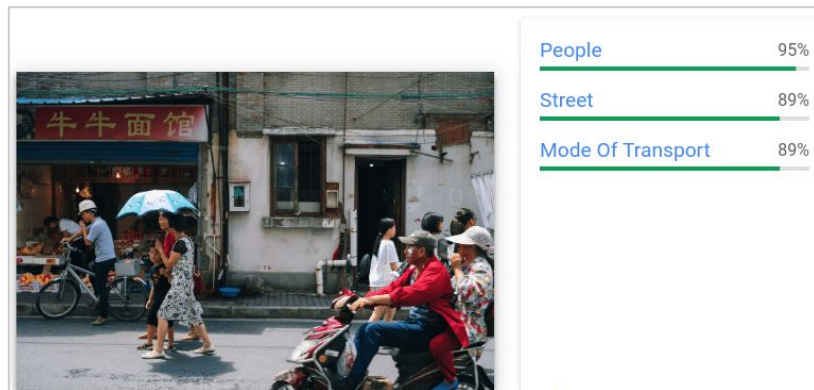
人像辨識



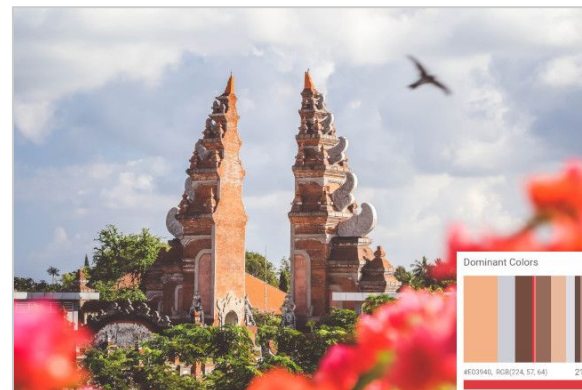
著名地標辨識



Logo 辨識



圖像標籤



圖像風格

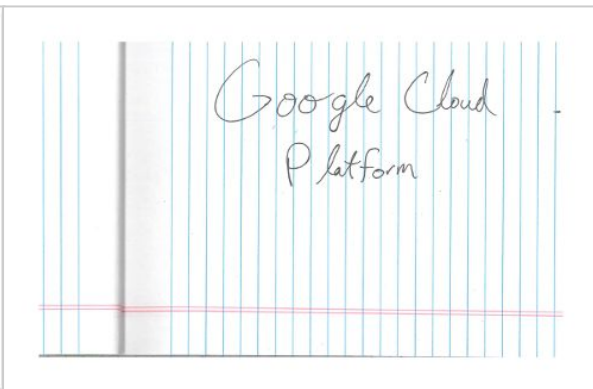
ML API – Vision (cont.)



圖像 OCR



圖像物件偵測



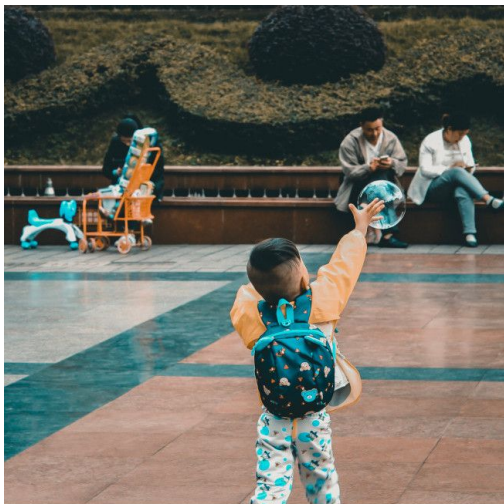
文本 OCR(包含手寫)



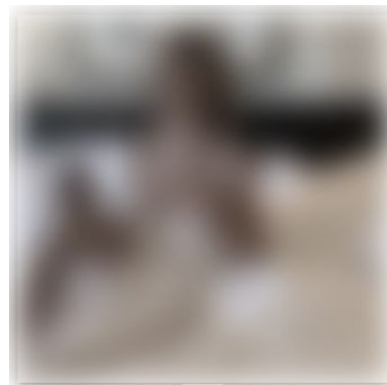
Image credit: Quinten de Graaf, Unsplash.

Category	Responses
Web entities	<ul style="list-style-type: none">• entityId: /m/02p7_j8, score: 1.3225499, description: Carnival in Rio de Janeiro• entityId: /m/06gmr, score: 1.1684971, description: Rio de Janeiro• entityId: /m/04cx88, score: 1.05945, description: Brazilian Carnival...
Full matching images	<ul style="list-style-type: none">• url: https://1000lugareparair.files.wordpress.com/2017/11/quinten-de-graaf-278848.jpg• url: https://freewalkingtourtterdam.com/wp-content/uploads/2017/07/quinten-de-graaf-278848.jpg...
Partial matching images	<ul style="list-style-type: none">• url: https://www.linnanneito.fi/wp-content/uploads/sambakarnevaal-riossa.jpg• url: https://static.airhelp.com/wp-content/uploads/2019/02/2610557/two-women-in-carnival-costumes.jpg...
Pages with matching images	<ul style="list-style-type: none">• url: https://travelnoire.com/best-carnival-celebrations-around-the-world/, pageTitle: Best Carnaval Celebrations Around The World - Travel Noire, fullMatchingImages: [https://travelnoire.com/wp-content/uploads/2019/02/quinten-de-graaf-278848-unsplash.jpg]• url: https://bespokebrazil.com/rio-carnival-2019/, pageTitle: Visit Rio Carnival 2019 with the Brazil Specialists - Bespoke Brazil, partialMatchingImages: [https://bespoke-brazil-2018.bespokebrazil.netdna-ssl.com/wp-content/uploads/2019/01/Carnival-1.jpg]...
Visually similar images	<ul style="list-style-type: none">• url: https://www.brazilbookers.com/_images/photos/rio-carnival-images/rio-carnival-2016-carnival-date.jpg• url: https://image.redbull.com/rbcom/010/2017-02-08/1331843859949_3/0100/0/1/watch-rio-carnival-2017-live-on-red-bull-tv.jpg...
Best guess labels	rio carnival 2019 dancers

網頁圖片內容



剪裁提示偵測



成人內容檢測
Explicit content detection
(SafeSearch)


- Provides likelihood ratings for the following explicit content categories: **adult**, **spoof**, **medical**, **violence**, and **racy**.
- Likelihoods ratings are expressed as 6 different values: **UNKNOWN**, **VERY_UNLIKELY**, **UNLIKELY**, **POSSIBLE**, **LIKELY**, or **VERY_LIKELY**.

ML API – Vision (cont.)

成人内容検測

Explicit content detection (SafeSearch)

Objects Labels Web Properties **Safe Search**




beach-man-woman.jpg

Adult	<div style="width: 20%;"></div>	Unlikely
Spoof	<div style="width: 10%;"></div>	Very Unlikely
Medical	<div style="width: 10%;"></div>	Very Unlikely
Violence	<div style="width: 20%;"></div>	Unlikely
Racy	<div style="width: 80%;"></div>	Very Likely

Likeliness values are Unknown, Very Unlikely, Unlikely, Possible, Likely, and Very Likely

Show JSON RESET NEW FILE

Faces Objects Labels Web Properties **Safe Search**

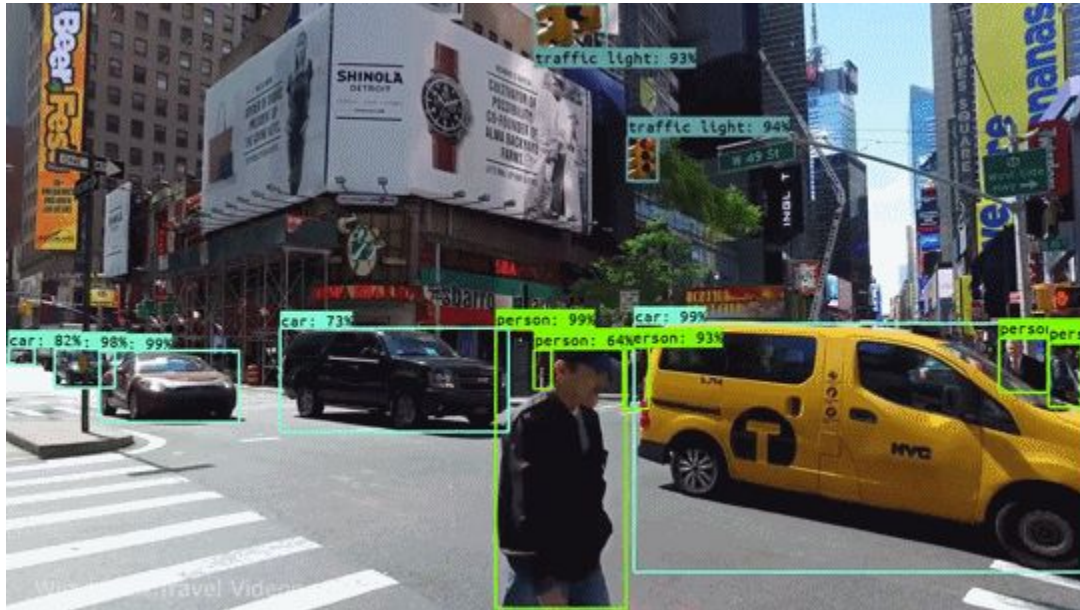


Adult	<div style="width: 80%;"></div>	Very Likely
Spoof	<div style="width: 10%;"></div>	Very Unlikely
Medical	<div style="width: 10%;"></div>	Very Unlikely
Violence	<div style="width: 10%;"></div>	Very Unlikely
Racy	<div style="width: 80%;"></div>	Very Likely

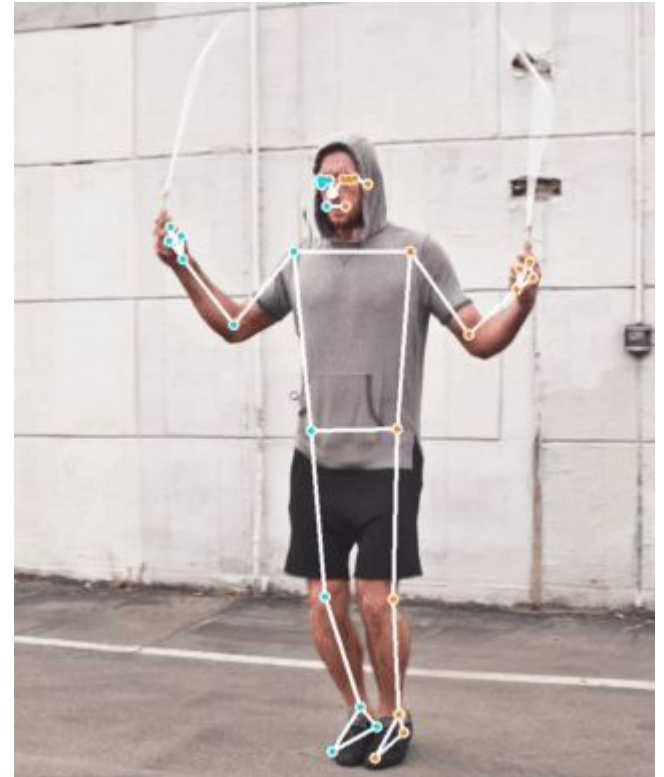
Likeliness values are Unknown, Very Unlikely, Unlikely, Possible, Likely, and Very Likely

Show JSON RESET NEW FILE

ML API – Intelligence



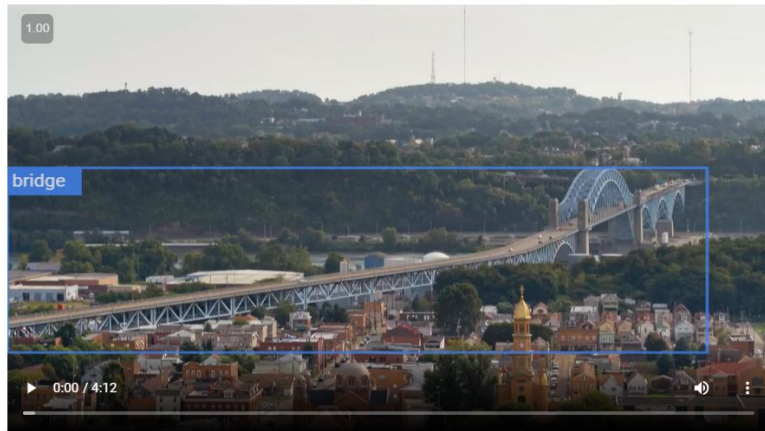
Object Detection and Tracking



Pose Detection

ML API – Intelligence

Video Intelligence API Visualiser



Try with your data

You can analyse a video by following the instructions [here](#). Also see the script [here](#) if you want to run all features at once.

This app **doesn't** send or store any of your video or annotation data. It just visualises local data files.

Your video

未選擇任何檔案

Your json

未選擇任何檔案

Label Detection

Shot Detection

Object Tracking

Person Detection

Face Detection

Logo Recognition

Speech Transcription

Text Detection

Explicit Content Detection

Confidence threshold 0.5

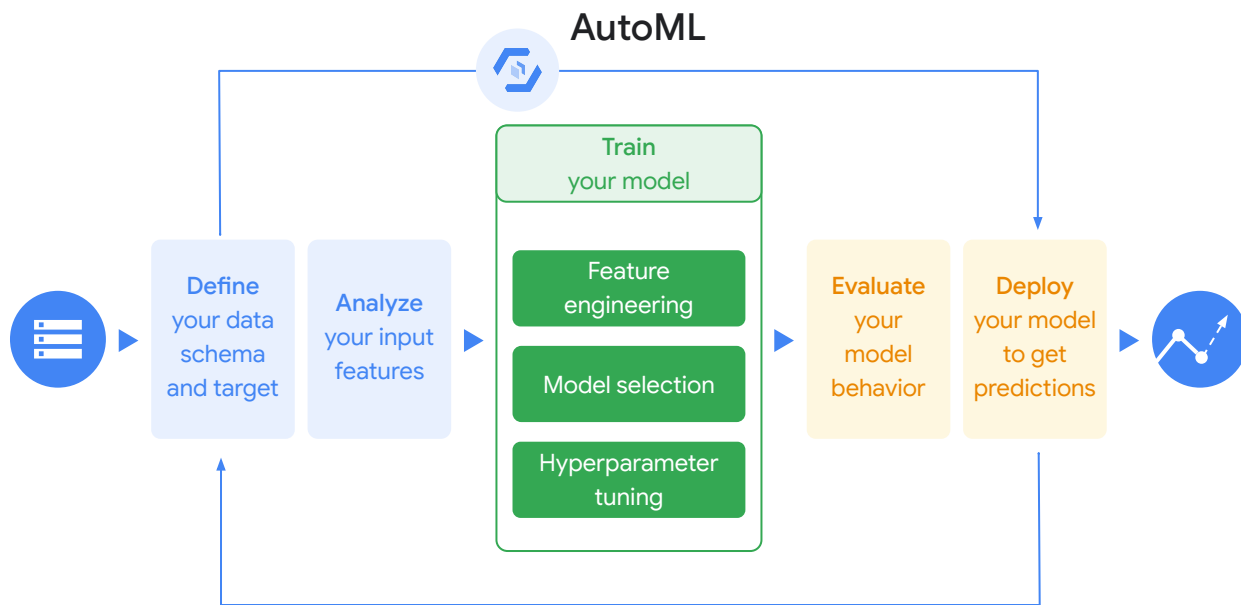


AutoML – Vision AI

Low/No code

Point and click to build custom, high-quality models using the **AutoML** workflow in **Vertex AI**

 [AutoML supported Algorithm](#)



Automatically search through Google's whole model zoo...

Linear, logistic

Feedforward DNN

Wide and Deep NN

Gradient Boosted Decision Tree (GBDT)

DNN + GBDT Hybrid

Adanet ensemble

Neural + Tree Architecture Search

...and more!

AutoML Overview

圖像分類(單標籤、多標籤)

圖像物件偵測

圖像分割

影像動作分類

影像分類

影像物件追蹤

文章分類(單標籤、多標籤)

文字實體識別

文字情緒分析

回歸 / 分類

預測

Image




Image classification (Single-label)
Predict the one correct label that you want assigned to an image.




Image classification (Multi-label)
Predict all the correct labels that you want assigned to an image.

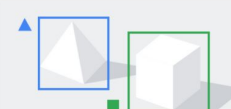


Image object detection
Predict all the locations of objects that you're interested in.

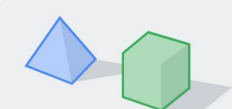




Image segmentation
Predict per-pixel areas of an image with a label.

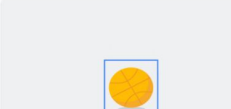
Video



Video action recognition
Identify the action moments in your videos.




Video classification
Get label predictions for entire videos, shots, and frames.




Video object tracking
Get labels, tracks, and timestamps for objects you want to track in a video.


Language



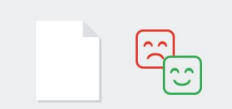
Text classification (Single-label)
Predict the one correct label that you want assigned to a document.



Text classification (Multi-label)
Predict all the correct labels that you want assigned to a document.




Text entity extraction
Identifies entities within your text items.




Text sentiment analysis
Understand the overall sentiment expressed in a block of text.

Tabular



Regression/classification
Predict a target column's value. Supports tables with hundreds of columns and millions of rows.



Forecasting PREVIEW
Predict the likelihood of certain events or demand.

AutoML – Vision AI

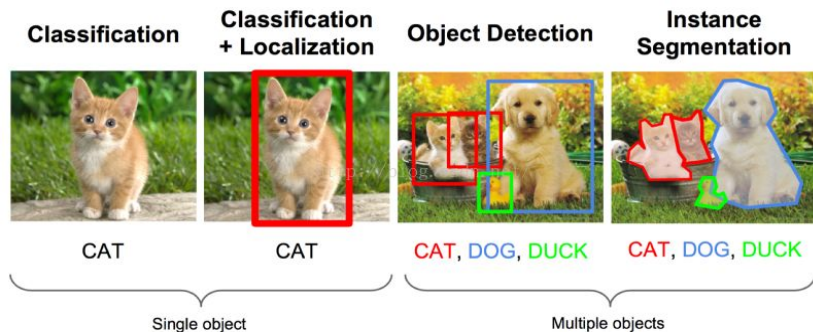


圖像分類(單標籤、多標籤)

圖像物件偵測

圖像分割

- 員工是否玩手機
- 口罩配戴是否合規
- 圖片分類歸納與校正



IMAGE

TABULAR

TEXT

VIDEO



Image classification (Single-label)

Predict the one correct label that you want assigned to an image.



Image classification (Multi-label)

Predict all the correct labels that you want assigned to an image.

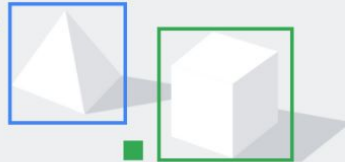


Image object detection

Predict all the locations of objects that you're interested in.



Image segmentation

Predict per-pixel areas of an image with a label.

AutoML - Vision AI for mask detection

Google Cloud Platform | sandbox | vertex

Vertex AI | untitled_1632885993746 | untitled_1632885993746... | TRAIN NEW MODEL | CREATE LABELING TASK

Dashboard | Datasets | Features | Labeling tasks | Notebooks | Pipelines | Training | Experiments | Models | Endpoints | Batch predictions | Metadata | Marketplace

IMPORT | **BROWSE** | ANALYZE

All 682 | Labeled 682 | Unlabeled 0 | Training 682 | Validation 0 | Test 0

Filter Filter labels +

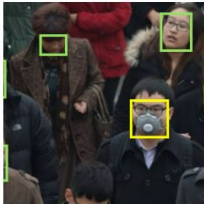
Images ▾


mask 654 | no_mask 270


ADD NEW LABEL


Filter Filter items

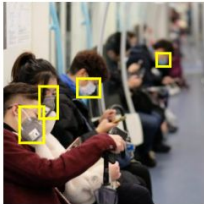
Select all

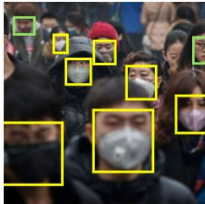
 no_mask (6), mask (1)


 mask (1)


 mask (1)

 no_mask (3), mask (2)









Items per page: 10 | 1 - 10 of many

- Vertex AI
- Dashboard
- Datasets**
- Features
- Labeling tasks
- Notebooks
- Pipelines
- Training
- Experiments
- Models
- Endpoints
- Batch predictions
- Metadata
- Marketplace

untitled_1632885993746

IMPORT BROWSE ANALYZE

All	682
Labeled	682
Unlabeled	0
Training	682
Validation	0
Test	0

Filter Filter labels +

Images

mask	654
no_mask	270

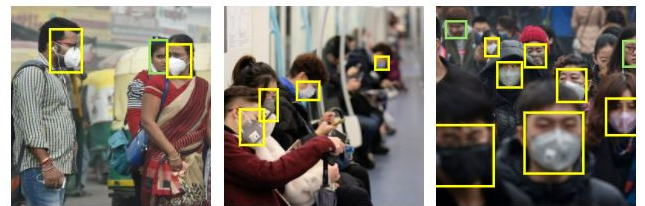
ADD NEW LABEL

Filter Filter items

Select all



no_mask (6), mask (1) mask (1) mask (1)



no_mask (3), mask (2) mask (4) mask (10), no_mask (2)



Training jobs and models

Use this dataset and annotation set to train a new machine learning model with AutoML or custom code

TRAIN NEW MODEL

Labeling tasks

If your data still needs to be labeled, create a labeling task to have others label it for you

CREATE LABELING TASK

Vertex AI

Dashboard

Datasets

Features

Labeling tasks

Notebooks

Pipelines

Training

Experiments

Models

Endpoints

Batch predictions

Metadata

Marketplace

1 Training method

2 Model details

3 Training options

4 Compute and pricing

START TRAINING

CANCEL

Dataset

untitled_1632885993746

Annotation set

untitled_1632885993746_jod

Objective

Image object detection

Please refer to the pricing guide for more details (and available deployment options) for each method.

- AutoML
Train high-quality models with minimal effort and machine learning expertise. Just specify how long you want to train. [Learn more](#)
- AutoML Edge
Train a model that can be exported for on-prem/on-device use. Typically has lower accuracy. [Learn more](#)
- Custom training (advanced)
Run your TensorFlow, scikit-learn, and XGBoost training applications in the cloud. Train with one of Google Cloud's pre-built containers or use your own. [Learn more](#)

CONTINUE

Vertex AI

Dashboard

Datasets

Features

Labeling tasks

Notebooks

Pipelines

Training

Experiments

Models

Endpoints

Batch predictions

Metadata

Marketplace

 Training method**2** Model details**3** Training options**4** Compute and pricing

START TRAINING

CANCEL

Model name *

untitled_1632885993746_20219294146



Data split

 Randomly assigned Manual (Advanced)

Your dataset will be automatically randomized and split into training, validation, and test sets using the following ratios.

Training

80 %

Validation

10 %

Test

10 %



Encryption

 Use a customer-managed encryption key (CMEK)[SHOW LESS](#)[CONTINUE](#)

Train new model

- ✓ Training method
- ✓ Model details
- 3 Training options
- 4 Compute and pricing

START TRAINING CANCEL

Goal	Accuracy	Latency
<input checked="" type="radio"/> Higher accuracy	Higher	800ms - 1,500ms
<input type="radio"/> Faster predictions	Lower	300ms - 500ms

Please note that prediction latency estimates are for guidance only. Actual latency depends on your network connectivity. Edge TPU predictions typically will have lower latency.

CONTINUE

↑ 如果選擇 AutoML

↓ 如果選擇 AutoML Edge

Train new model

- ✓ Training method
- ✓ Model details
- ✓ Explainability (optional)
- 4 Training options
- 5 Compute and pricing

START TRAINING CANCEL

Goal	Package size	Accuracy	Latency on iPhone X
<input type="radio"/> Higher accuracy	5.6 MB	Higher	34ms
<input checked="" type="radio"/> Best trade-off	3.1 MB	Medium	23ms
<input type="radio"/> Faster predictions	557 KB	Lower	8ms

Please note that prediction latency estimates are for guidance only. Actual latency depends on your network connectivity. Edge TPU predictions typically will have lower latency.

Models are based on state-of-the-art research at Google. Your model will be available as quantized TF Lite, TensorFlow, and Core ML packages.

CONTINUE



Train new model

Vertex AI

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 Training method Model details Training options 4 Compute and pricing

START TRAINING

CANCEL

Enter the **maximum** number of node hours you want to spend training your model.

You can train for as little as 20 node hours. You may also be eligible to train with free node hours. [Pricing guide](#)

Budget *

20

Maximum node hours

Estimated completion date: Sep 29, 2021 3 PM GMT+8 Enable early stopping

Ends model training when no more improvements can be made and refunds leftover training budget. If early stopping is disabled, training continues until the budget is exhausted.

模型部署

The screenshot shows the Google Cloud Platform Vertex AI interface for evaluating a model. The breadcrumb path is 'mask-ai-sean-vertex_202181074449'. The 'EVALUATE' tab is active, showing a 'Filter' section with labels and their counts, and a main evaluation area with metrics and thresholds.

Filter Filter labels

All labels	0
mask	0.68372
no_mask	0.51767

Confidence threshold 0.5 **IoU threshold** 0.5

All labels

Average precision	0.649
Precision	94.2%
Recall	60.9%
Created	Aug 10, 2021, 9:18:25 PM
Total images	898
Training images	682
Validation images	100
Test images	116

To evaluate your model, set the **confidence threshold** to see how precision and recall are affected. The best confidence threshold depends on your use case. Read some [example scenarios](#) to learn how evaluation metrics can be used.

模型評估

The screenshot shows the 'Deploy to endpoint' configuration interface in Google Cloud AI Platform. The left sidebar contains navigation icons and a list of endpoints, with 'youjun-mask-ai' selected. The main content area is titled 'Deploy to endpoint' and features a progress indicator with two steps: '1 Define your endpoint' (active) and '2 Model settings'. Below the progress indicator are 'DEPLOY' and 'CANCEL' buttons. The configuration panel on the right includes radio buttons for 'Create new endpoint' (selected) and 'Add to existing endpoint'. It has a text input for 'Endpoint name *' with a help icon. The 'Location' section has a 'Region' dropdown menu set to 'us-central1 (Iowa)'. The 'Access' section contains explanatory text and two radio button options: 'Standard' (selected) and 'Private'. A 'CONTINUE' button is located at the bottom of the configuration panel.

Deploy to endpoint

- 1 Define your endpoint
- 2 Model settings

DEPLOY CANCEL

Create new endpoint Add to existing endpoint

Endpoint name *

Location

Region
us-central1 (Iowa)

Access

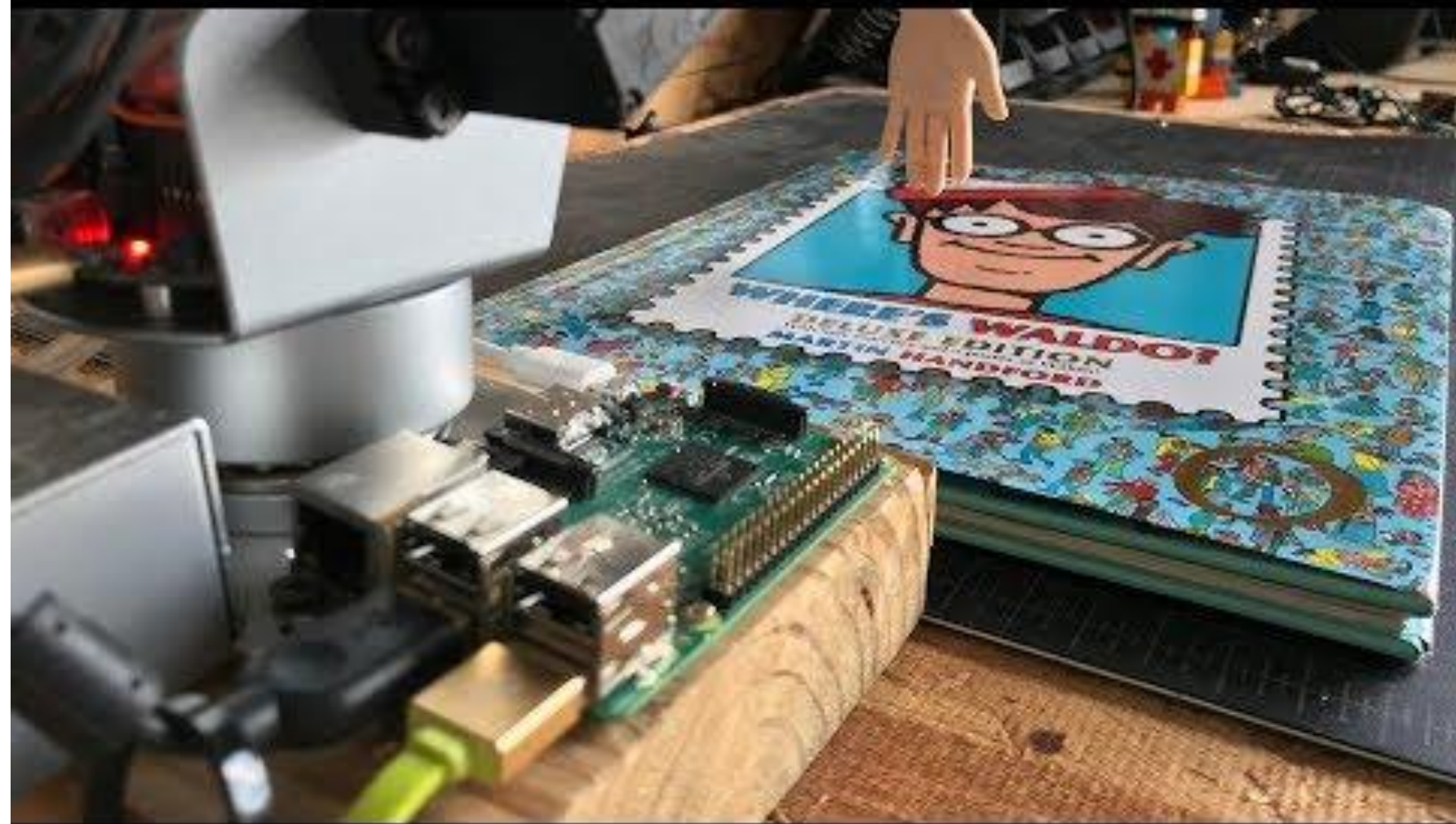
Determines how your endpoint can be accessed. By default, endpoints are available for prediction serving through a REST API. Endpoint access can't be changed after the endpoint is created.

Standard
Makes the endpoint available for prediction serving through a REST API. AutoML and custom-trained models can be added to standard endpoints.

Private
Create a private connection to this endpoint using a VPC network and [private services access](#). Only custom-trained and tabular models can be added to private endpoints. [Learn more](#)

ADVANCED OPTIONS

CONTINUE



Any Questions



Google Developer
Student Clubs





Thank you

特別感謝「淡江大學 TKU - Google 學生開發者社群 (GDSC)」

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